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The Index In Analyzing Food Commodity Price Movements In Indonesia For The Period 2018-2024

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Abstract

Penelitian ini bertujuan untuk mengetahui efektivitas penggunaan harga indeks dalam menganalisis pergerakan harga komoditas pada suatu periode tertentu. Melalui analisis historis dan metode statistik, penelitian ini bertujuan untuk mengetahui sejauh mana angka indeks dapat digunakan sebagai alat analisis di pasar komoditas. Metode yang digunakan meliputi rumus indeks harga Laspeyres, Paasche, dan Ideal Fisher. Hasil penelitian ini menunjukkan bahwa dengan menggunakan metode perhitungan indeks Laspeyres, Paasche, dan Ideal Fisher, dapat disimpulkan bahwa harga komoditas pangan mengalami kenaikan yang cukup signifikan. Kenaikan harga ini mengindikasikan adanya inflasi pada sektor pangan, sehingga diperlukan strategi pengendalian inflasi untuk menjaga kestabilan harga. Penyesuaian upah dan kebijakan sosial harus memperhitungkan kenaikan ini untuk melindungi daya beli masyarakat. Selain itu, kebijakan yang mendukung produksi dan distribusi pangan perlu ditingkatkan untuk menstabilkan harga. Kenaikan harga pangan di Indonesia pada periode ini mengindikasikan perlunya perhatian yang serius untuk menjamin stabilitas harga dan ketahanan pangan nasional.

Kata Kunci: *Ekonomi, Indeks Harga, Statistik*

Abstract

This study aims to explore the effectiveness of the use of index prices in analyzing commodity price movements over a certain period. Through historical analysis and statistical methods, this study aims to find out the extent to which index numbers can be used as an analysis tool in the commodity market. The methods used include the Laspeyres, Paasche, and Ideal Fisher price index formulas. The results of this study show that by using the Laspeyres, Paasche, and Ideal Fisher index calculation method, it can be concluded that food commodity prices have increased significantly. This increase in prices indicates inflation in the food sector, which requires an inflation control strategy to maintain price stability. Wage adjustments and social policies must take into account these increases to protect people's purchasing power. In addition, policies that support food production and distribution need to be improved to stabilize prices. The increase in food prices in Indonesia during this period shows the need for serious attention to ensure price stability and national food security.

Keywords: *Economics, Priice Index, Statistics*

INTRODUCTION

The commodity market is one of the important and dynamic segments of the financial market, which has a significant global impact. The movement of commodity prices, such as food, energy, and metals, is greatly influenced by various factors, ranging from weather conditions, changes in government policies, to geopolitical tensions. Therefore, the commodity market often experiences high volatility, which makes price analysis very important. This analysis of commodity price movements is not only needed by producers and traders to plan production and distribution, but also by investors who want to make the right investment decisions. In this case, effective and reliable analysis tools are needed to predict price fluctuations and manage risks associated with commodity price movements (Deaton, 1999).

One of the analytical tools widely used in observing commodity price movements is the commodity price index. A commodity price index is a statistical tool that measures price changes in a particular group of commodities over time. This index provides an aggregate picture of overall commodity price fluctuations, allowing market participants to see long-term price trends. For example, the food price index is often used to observe price changes in various types of food commodities, such as rice, corn, and soybeans. The use of the commodity price index in Indonesia is very relevant, considering that the agricultural and food sectors are vital sectors in the country's economy (Suranto & Nugroho, 2022).

In Indonesia, the movement of food commodity prices has a direct impact on people's welfare, especially for groups that depend on food commodities as their main source of

consumption. Therefore, understanding the dynamics of food prices is very important, both for formulating government policies and for planning business strategies for market players. The use of commodity price indices can provide better insight into food price movements over a certain period, which in turn can help policy makers to formulate more effective policies in addressing food inflation and price stability (Tietenberg & Lewis, 2016).

However, although the commodity price index can provide a broad picture of price movements, there is debate about the effectiveness of using this index in analysing commodity prices in depth. Several studies have shown that the price index can provide useful signals regarding price trends and help market players plan business strategies. However, there are also those who consider that the price index has limitations, especially related to the calculation methodology that can affect the results of the analysis. For example, the selection of the base year in the price index can produce different results, depending on the period selected. Therefore, choosing the right price index method is very important in analysing commodity price movements (Fisher, 1922).

Several types of price indices that are often used in analysing commodity price movements include the Laspeyres, Paasche, and Ideal Fisher Price Indices. The Laspeyres Index uses prices and quantities from the base period to calculate price changes, while Paasche uses prices and quantities from the period being analysed. Meanwhile, the Ideal Fisher Index attempts to combine these two approaches to obtain a more balanced picture. Each of these methods has advantages and disadvantages, depending on the context of the analysis and the objectives to be achieved. Therefore, a deep understanding of how each of these index methods works and applies is essential to evaluating the effectiveness of their use in analysing commodity price movements (Hill & Griffiths, 2011).

In the context of Indonesia, the use of price indices to analyse food commodity price movements is very relevant, considering the dependence of society on the food sector and its impact on the economy. This study aims to explore and evaluate the extent to which the use of index numbers is effective in analysing food commodity price movements in Indonesia in the period 2018-2024. By using several price index methods, this study is expected to provide a better understanding of the benefits and limitations of using price indices in predicting commodity price movements in the Indonesian market (Kakwani, 1997).

Thus, this study aims to explore and evaluate the extent to which the use of index numbers is effective in analysing commodity price movements. The approach that will be used includes several price index methods including the Laspeyres, Paasche, and Ideal Fisher price indices. These methods can help to gain a deeper understanding of the potential use

of index numbers as an analytical tool in the commodity market, as well as presenting case examples to provide a deeper understanding.

METHOD

This study uses a descriptive qualitative approach to explain the use of index numbers in analyzing commodity price movements. This approach aims to provide an in-depth understanding of how index numbers are used as an analytical tool in the commodity market. The data collection method is carried out through a literature review, focusing on books, journal articles, and other written sources that are relevant to the use of index numbers in commodity market analysis. The data collected will be analyzed qualitatively, allowing for an in-depth interpretation of the complexity and context of the use of index numbers in analyzing commodity price movements. Through this approach, this study is expected to provide a more holistic understanding of the effectiveness of index numbers as an analytical tool in the commodity market, thereby providing better insight for stakeholders in making investment decisions (Benny Pasaribu, et al., 2021).

RESULTS AND DISCUSSION

Price index

A price index is a statistical tool used to measure changes in price levels over time. It reflects changes in the prices of goods and services in an economy and can be used for a variety of purposes, including measuring inflation, wage adjustments, and economic analysis (Mahendra, 2016). The following are types of price indexes that are often used, including:

1. Consumer Price Index. Measures the change in the average price paid by consumers for a specific basket of goods and services over time.
2. Producer Price Index. Measures the change in the prices producers receive for their goods and services before they reach consumers. It reflects changes in costs at the production level.
3. Wholesale Price Index. Measures price changes at the wholesale level, often used to see price changes before they reach the end consumer.
4. Trade Price Index. Used to measure changes in the prices of goods in international trade, both for exports and imports.

The uses of the price index are as follows:

1. The price index is used to calculate the inflation rate, reflecting the percentage increase in the prices of goods and services over a period.

2. The price index is used to adjust wages and salaries to reflect rising costs of living.
3. Price indexes are used to analyse and study economic trends and make predictions about the future economy.

Price Index Calculation Method

Price Relatives Index

The relative price index is one type of index that is useful for understanding and interpreting changes in the economy and business over time. This index provides insight into how the current price per unit of goods compares to the price in the base period (Rizqi Widi Feirdani, 2008). In other words, this index measures the change in the price per unit of goods from one period to another in the form of a percentage relative to the base year. The formula for calculating a simple relative price index is:

$$I = \frac{P_t}{P_0} \times 100$$

Where:

I : Relative price index

P_t : Price of goods in the year analyzed

P_0 : Price of goods in the base year

Aggregate Price Index

The aggregate price index is used to measure the combined change of various goods as a whole. The focus of this index number is aggregation, which includes more than one type of goods and services. The aggregate price index allows us to understand price issues as a whole or macro, not individually (Eka Putri Wulandari, 2024). There are two types of aggregate price indexes, namely:

1. Unweighted Aggregate Price Index

The unweighted aggregate price index is used for goods that have the same units. This index is calculated by dividing the total price in a given period by the total price in the base period. The formula for calculating the unweighted aggregate price index in the period$t$= (It) is:

$$I_t = \frac{\sum P_{it}}{\sum P_{i0}}$$

Where:

P_{it} : Price per unit of good i in the year analyzed

P_{i0} : Price per unit of good i in the base year

This index provides an overview of price changes for a group of goods as a whole without considering the weight of each item.

2. Weighted Aggregate Price Index

The weighted aggregate price index is an index created by taking into account various factors that affect the fluctuation of the index figure. In creating this index, the following considerations are usually used:

a. Relative Importance. Relative importance refers to the importance of each item in the group being analyzed. Items that are more important or used more in consumption or production will be given a greater weight in the index. This means that a more significant change in the price of the item will have a greater impact on the overall index.
b. Factors that influence the rise and fall of the index. These factors include all elements that can cause changes in the price of goods. An example is production. Production influences prices through the supply and demand mechanism. If production increases, the supply of goods will also increase. If consumer demand and purchasing power remain constant, then an increase in supply can cause a decrease in prices. Conversely, if production decreases, the supply of goods will decrease and prices will tend to rise. Therefore, in creating price indices, production quantity is often used as a weighing factor.

By taking these factors into account, the weighted aggregate price index provides a more accurate and holistic picture of overall price changes, reflecting the influence of each good according to its weight in the economy. This helps economists, policymakers, and business people to understand price dynamics and make better decisions based on comprehensive analysis. Some methods for calculating the weighted aggregate price index are:

a. Laspeyres Index

Etienne Laspeyres developed this method in the late 19th century to calculate a weighted price index using quantities from the base period as weights. In this method, the price index is calculated using the formula:

$$I_L = \frac{\sum(P_t \times Q_0)}{\sum(P_o \times Q_0)} \times 100$$

Information:

IL : Laspeyres Index.

Pt : Price of goods in the period analyzed.

P_0 : Price of goods in the base period.

Q_0 : Quantity of goods in the base period.

This method allows us to measure aggregate price changes by retaining the quantity weights from the base period, giving an idea of how much price changes occur from one period to another. However, this method has the disadvantage that it assumes

that the quantity of consumption in the base period remains relevant for the period being calculated. This means that this index assumes that the consumption of goods has not changed significantly between the base period and the period being analyzed. In reality, consumption patterns often change. Such changes are not accommodated by the Laspeyres Index, which can result in an index that is less accurate in reflecting price changes.

b. Paasche Index

The Paasche index is a way of calculating a weighted price index using quantities from the current period as weights. The formula for calculating this index is:

$$I_P = \frac{\sum(P_t \times Q_t)}{\sum(P_0 \times Q_t)} \times 100$$

Information:

IP : Paasche Price Index.

Pt : Price of goods in the period analyzed.

P_0 : Price of goods in the base period.

Qt : Quantity of goods in the period analyzed.

The main advantage of the Paasche Index is that it uses quantities from a more recent period, making it more responsive to changes in consumption patterns. If there is a significant change in the quantity of goods consumed since the base period, this change will be reflected in the calculation of the Paasche Index. This makes it a more accurate tool for analysing price changes in the context of actual consumption dynamics.

c. Drobisch Index

Drobisch's formulation is an attempt to overcome the significant differences between the Laspeyres index and the Paasche index. To overcome this problem, Drobisch advocates the development of an alternative index that is more accurate and reliable. This approach may include combining the characteristics of both methods or using a new approach that is more appropriate in representing actual price changes. Thus, the purpose of developing an alternative index is to improve the accuracy and reliability in measuring price changes more accurately and relevantly. Mathematically, the Drobisch Index formula can be expressed as follows:

$$ID = \frac{\left[\frac{\sum P_t Q_0}{\sum P_0 Q_0} \times 100\right] + \left[\frac{\sum P_t Q_t}{\sum P_0 Q_t} \times 100\right]}{2}$$

Or

$$ID = \frac{I_L + I_P}{2}$$

Information:

ID : Drobisch Price Index.

IL : Laspeyres Price Index.

IP : Paasche Price Index.

Using the Drobisch formula, this price index attempts to reduce the bias present in the Laspeyres and Paasche indices by taking the average of both, thus providing a more balanced estimate of price changes.

d. Fisher's Ideal Index

Fisher's Ideal Index is a method for measuring price or quantity changes that combines the advantages of the Laspeyres index and the Paasche index. This index was proposed by economist Irving Fisher and is considered an ideal index because it meets several important accuracy tests in index theory. The Fisher index is calculated as the geometric mean of the Laspeyres index and the Paasche index. The mathematical formula is as follows:

$$I_F = \sqrt{I_L \times I_P}$$

Information:

IF : Fisher's Ideal Index.

IL : Laspeyres Price Index.

IP : Paasche Price Index.

The Fisher index is recognized for several important reasons:

a. By taking the geometric mean of the Laspeyres and Paasche indices, the Fisher Index reduces the bias that may arise when using only one of the indices. Laspeyres tends to overestimate because it uses weights from the base period, while Paasche tends to underestimate because it uses weights from the current period.

b. The Fisher index is better at meeting tests of appropriateness such as the time factor test and the substitution test. The time factor test ensures that the price index does not change if all prices and quantities in the two periods change proportionately. The substitution test ensures that relative price changes take into account changes in consumption or production patterns.

c. Because it uses information from both periods (base period and current period), the

Fisher Index is more consistent in reflecting price and quantity changes that occur in the market.

d. The Fisher index is widely used in economic and statistical analysis because it provides more balanced and reliable results compared to other indices.

Overall, the Fisher Index is a very useful tool in economic analysis because it combines the advantages of the two most commonly used index methods, providing a more accurate and balanced estimate of price or quantity changes.

e. Marshall and Edgeworth Index

The Marshall-Edgeworth Index is one of the methods used to calculate price and quantity indices that combines elements of the Laspeyres and Paasche index methods in order to produce a more balanced estimate. The formula for this index uses the arithmetic average of quantities over two different time periods. The Marshall-Edgeworth Index formula can be stated as follows:

$$I_{ME} = \frac{\sum P_t \, (Q_0 + Q_t)}{\sum P_0 \, (Q_0 + Q_t)}$$

Overall, the Marshall-Edgeworth Index offers a more balanced solution for measuring price and quantity changes.

f. Walsh Index

The Walsh index is a method for measuring price or quantity changes by considering the advantages of several different price index methods. The Walsh index introduces an approach that uses the mean of squares to calculate price changes, providing a more stable and representative estimate. This formula can be formulated as follows:

$$I_W = \frac{\sum (P_t \sqrt{Q_0 Q_t})}{\sum (P_0 \sqrt{Q_0 Q_t})} \times 100$$

Overall, the Walsh formula provides a powerful tool for economists and analysts to measure price changes in a more balanced and reflective way of market dynamics.

Discussion

We will analyze the movement of several food commodity prices in Indonesia over the past few years, excluding the anomalous conditions in 2021-2022. The food commodity price data that will be used are as follows:

Table 1. Food Prices and Food Consumption Quantities in Indonesia

Commodity	Unit	Consumer Food Prices (Rp)					Consumption Quantity (000) Tons				
Food		2018	2019	2020	2023	2024	2018	2019	2020	2023	2024
Medium Rice	Kg	13,227	11,597	11,284	13,600	13,600	24,979	25,720	25,433	35,300	35,700
Meat ChickenRace	Kg	31,703	35.120	35,564	34,500	37,940	2.115	2.272	1.905	1,971	2,078
Beef	Kg	115,481	114.195	120,480	135,910	136,030	703	444	446	627	745
Egg	Kg	21,010	23,470	25.112	30,550	30,980	2,034	1,903	1,924	1,951	1,864
Sugar	Kg	14,801	13,677	12,998	16,060	18,400	2.457	1,850	1,826	1,742	1.615
Cooking oil	Liter	12,574	12.140	12,288	15,830	15,830	2,512	2.303	2.363	2,610	2,663
Rainfall											

Here is an analysis of the price movements of several food commodities in Indonesia using the data provided. We will use the Laspeyres, Paasche, and Ideal Fisher formulas to analyse the price index.

1. Calculating the Laspeyres Index

   Formula:

$$I_L = \frac{\sum(P_t \times Q_0)}{\sum(P_o \times Q_0)} \times 100$$

Table 2. Analysis Using Laspeyres Price Index

No	Food Commodities	Unit	Food Price (Rp)		Consumption Quantity (000) Ton	Laspeyres Index (IL)	
			2018 ($\boldsymbol{P0}$)	2024 ($\boldsymbol{Pt}$)	2018 ($\boldsymbol{Q0}$)	$\boldsymbol{Pt.Q0}$	$\boldsymbol{P0.Q0}$
1.	Rice	Kg	13,227	13,600	24,979	339,714,400	330,397,233
2.	Chicken meat	Kg	31,703	37,940	2.115	80.243.100	67,051,845
3.	Beef	Kg	115,481	136,030	703	95,629,090	81.183.143
4.	Egg	Kg	21,010	30,980	2,034	63,013,320	42,734,340
5.	Sugar	Kg	14,801	18,400	2.457	45,208,800	36,366,057
6.	Cooking oil	Liter	12,574	15,830	2,512	39,764,960	31,585,888
					Amount	663,573,670	589,318,506

$$I_L = \frac{663.573.670}{589.318.506} \times 100$$
$$I_L = 1{,}126 \times 100$$
$$I_L = 112{,}6$$

2. Calculating the Paasche Index

Formula:

$$I_P = \frac{\sum(P_t \times Q_t)}{\sum(P_0 \times Q_t)} \times 100$$

Table 3. Analysis Using the Paasche Price Index

No	Food Commodities	Unit	Food Price (Rp)		Quantity Consumption (000) Ton	Paasche Index (IP)	
			2017 ($\boldsymbol{P0}$)	2023 ($\boldsymbol{Pt}$)	2023 ($\boldsymbol{Qt}$)	$\boldsymbol{Pt.Qt}$	$\boldsymbol{P0.Qt}$
1.	Rice	Kg	13,227	13,600	35,700	485,520,000	472.203.900
2.	Chicken meat	Kg	31,703	37,940	2,078	78,839,320	65,878,834
3.	Beef	Kg	115,481	136,030	745	101,342,350	86,033,345
4.	Egg	Kg	21,010	30,980	1,864	57,746,720	39,162,640
5.	Sugar	Kg	14,801	18,400	1.615	29,716,000	23,903,615
6.	OilFry	Liter	12,574	15,830	2,663	42,155,290	33,484,562
					Amount	795,319,680	720,666,896

$$I_P = \frac{795.319.680}{720.666.896} \times 100$$
$$I_L = 1{,}104 \times 100$$
$$I_L = 110{,}4$$

3. Calculating Fisher's Ideal Index

Formula:

$$I_F = \sqrt{I_L \times I_P}$$
$$I_F = \sqrt{112{,}6 \times 110{,}4}$$
$$I_F = \sqrt{12.431{,}04}$$
$$I_F = 111{,}5$$

Explanation:

1. Laspeyres Price Index

This index uses base year quantities (2018) to calculate the change in 2024 prices relative to 2018 prices. The Laspeyres index value of 112.6 indicates that overall food commodity prices increased by 12.6% from 2018 to 2024.

2. Paasche Price Index

This index uses the observed year (2023) quantities to calculate how prices in 2022 changed relative to prices in 2017. A Paasche index value of 110.4 indicates that prices increased by 10.4% from 2018 to 2024.

3. Fisher's Ideal Price Index

It is the geometric mean of the Laspeyres and Paasche indices, providing a more balanced picture of price changes. The Ideal Fisher index value of 111.5 indicates a price increase of around 11.5% from 2018 to 2024.

Table 4. Summary of Calculations

Index	Mark	Improvement
Laspayres	112.6	12.6%
Passover	110.4	10.4%
Ideal Fisher	111.5	11.5%

This information shows that overall, food commodity prices in Indonesia have increased during the analyzed period. This can be the basis for further analysis of the factors that influence food prices and policies that can be taken by stakeholders to maintain price stability.

CONCLUSION

The price index is used to analyze the movement of food commodity prices in Indonesia during 2018-2024 by excluding anomalous conditions in 2021-2022. Using the Laspeyres, Paasche, and Ideal Fisher index calculation methods, it can be concluded that food commodity prices have increased significantly. This price increase indicates inflation in the food sector, which requires an inflation control strategy to maintain price stability. Wage adjustments and social policies must take this increase into account to protect people's purchasing power. In addition, policies that support food production and distribution need to be improved to stabilize prices. The increase in food prices in Indonesia during this period indicates the need for serious attention to ensure price stability and national food security.

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